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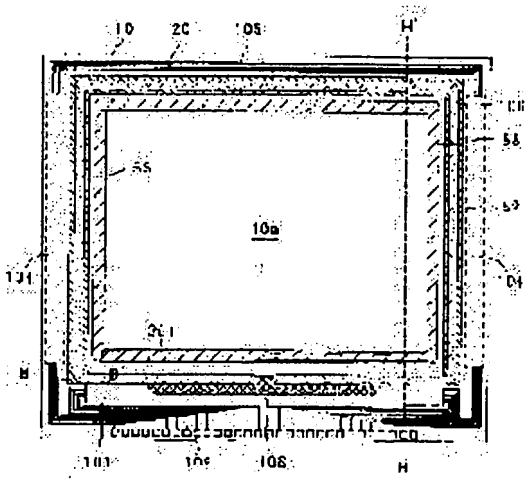
(54) ELECTROOPTICAL DEVICE AND ITS MANUFACTURING METHOD, AND PROJECTION TYPE DISPLAY

(57)Abstract:
PROBLEM TO BE SOLVED: To simplify the constitution regarding a sealing material for sticking a couple of substrates together and the constitution regarding the vertical conduction between the couple of substrates, in an electrooptical device such as a liquid crystal device.
SOLUTION: In the electrooptical device, an electrooptical substance (50) is sandwiched between a 1st substrate (10) and a 2nd substrate (20). Between both the substrates, the sealing material for adhering both the substrates to each other along their circumferences is provided. On the 1st substrate, pixel electrodes, wires extending from inside an image display area to outside the seal area, and a vertical conduction pad arranged in the seal area are provided. On the 2nd substrate, a counter electrode is provided which is arranged opposite the pixel electrodes and has a vertical conduction part facing the vertical conduction pad. The sealing material is made of conductive materials at the part arranged at least between the vertical conduction pad and vertical conduction part and functions as a vertical conduction material.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
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CLAIMS

[Claim(s)]
[Claim 1] It comes to pinch electrooptic material between the 1st and 2nd substrates of a pair. Between said 1st and 2nd substrates Two or more pixel electrodes arranged to the image display field which is equipped with the sealant which carries out phase adhesion of said 1st and 2nd substrates in the seal field which saw superficially and met those perimeters, saw superficially on said 1st substrate, and was surrounded in said seal field, It has wiring extended outside said seal field from the inside of said image display field, and the vertical flow pad arranged in said seal field. On said 2nd substrate, it has the counterelectrode which has the vertical flow section which opposite arrangement is carried out at said pixel electrode, and counters said vertical flow pad. Said sealant The electro-optic device characterized by the part arranged between said vertical flow pad and said vertical flow section at least consisting of a conductive ingredient.
[Claim 2] Said vertical flow pad is an electro-optic device according to claim 1 characterized by occupying at least one of three sides of said seal fields predetermined.
[Claim 3] Said vertical flow pad is an electro-optic device according to claim 2 characterized by being formed the side in which the inlet for pouring in said electrooptic material among the neighborhoods which constitute said seal field is not established.
[Claim 4] An electro-optic device given in any 1 term of claims 1-3 characterized by mixing the gap material which controls the gap between said 1st and 2nd substrates in said sealant.
[Claim 5] Said gap material is an electro-optic device according to claim 4 characterized by consisting of a conductive particle in the sealant part arranged between said vertical flow pad and said vertical flow section at least.
[Claim 6] Said conductive particle is an electro-optic device according to claim 5 characterized by consisting of a particle of the shape of the shape of a bead by which metal plating was carried out, and a fiber.
[Claim 7] An electro-optic device given in any 1 term of claims 1-6 characterized by mixing the metal powder into the part arranged between said vertical flow pad and said vertical flow section at least among said sealants.
[Claim 8] Said sealant is an electro-optic device given in any 1 term of claims 1-7 characterized by including said conductive ingredient over said all seal fields.
[Claim 9] Said sealant is an electro-optic device given in any 1 term of claims 1-7 characterized by consisting of said conductive ingredient partially at least, and consisting of an electric insulation ingredient in the field which does not counter said vertical flow pad among said seal fields in the field which counters said vertical flow pad among said seal fields.
[Claim 10] The front face of said vertical flow pad formed in said seal field is an electro-optic device given in any 1 term of claims 1-9 characterized by being formed on the same flat surface as the front face of the insulator layer in said seal field.
[Claim 11] The front face of said vertical flow pad formed in said seal field To the front face of the insulator layer in said seal field, a level difference is prepared and it is formed. In said sealant An electro-optic device given in any 1 term of claims 1-9 characterized by mixing gap material with the path respectively corresponding to the gap of the field of said vertical flow pad, and the field of said insulator layer in order to control the gap between said 1st and 2nd substrates.

[Claim 12] The electro-optic device according to claim 11 characterized by arranging the sealant with which the gap material of the minor diameter corresponding to the field where a gap is small was mixed by the border area where a gap is large in the border area from which said gap changes among said seal fields in the field of said vertical flow pad, and the field of said insulator layer.
[Claim 13] Said sealant is an electro-optic device given in any 1 term of claims 1-12 characterized by coming to contain thermosetting resin or heat, and a photo-setting resin.
[Claim 14] The manufacture approach of the electro-optic device characterized by to include the process which is the manufacture approach of an electro-optic device of manufacturing the electro-optic device of a publication in any 1 term of claim 1 to claim 13, and forms said pixel electrode, said wiring, and said vertical flow pad on said 1st substrate, the process which forms said counterelectrode on said 2nd substrate, and the process which carries out phase adhesion of said 1st substrate and said 2nd substrate by said sealant.
[Claim 15] The manufacture approach of the electro-optic device according to claim 14 characterized by having further the process which carries out flattening of said vertical flow pad.

[Claim 16] The process which carries out phase adhesion by said sealant is the manufacture approach of the electro-optic device according to claim 14 characterized at the process which draws the sealant with which the gap material of the 1st path was mixed by the seal field part which counters said vertical flow pad by the dispenser of 1, and the seal field part which do not counter said vertical flow pad by for said 1st path to include the process which draws the sealant with which the gap material of the 2nd different path was mixed by other dispensers.
[Claim 17] The process which carries out phase adhesion by said sealant is the manufacture approach of an electro-optic device given in any 1 term of claims 14-16 characterized by to include the process which draws the sealant with which conductive gap material was mixed by the seal field part which counters said vertical flow pad by the dispenser of 1, and the process which draws the sealant with which the gap material of electric insulation was mixed by the seal field part which does not counter said vertical flow pad by other dispensers.
[Claim 18] The process which carries out phase adhesion by said sealant is the manufacture approach of an electro-optic device given in any 1 term of claim 14 and others [17] which are characterized by including the process heated to the sealant which comes to contain thermosetting resin or heat, and a photo-setting resin.
[Claim 19] The projection mold display characterized by having the light source, the light valve which becomes any 1 term of claims 1-13 with the electro-optic device of a publication, the light guide section material which carries out the light guide of the light generated from said light source to said light valve, and the incident light faculty material which projects the light modulated with said light valve.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention belongs to the technical field of electro-optic devices, such as liquid crystal equipment equipped with the electrode of the pair prepared at the side which it comes to pinch electrooptic material and faces the electrooptic material in these substrates between the 1st and 2nd substrates of the pair stuck by the sealant around the image display field, and the manufacture approach of those.
[0002]
[Background of the Invention] Generally with this kind of electro-optic device, it has the TFT array substrate with which wiring of the data line which is connected to the thin film transistor (TFT (Thin Film Transistor) is called suitably below) and this which carry out switching control of a pixel electrode and this, and supplies a picture signal and a scan signal, the scanning line, etc. was prepared. Furthermore, opposite arrangement is carried out at the side by which wiring of this TFT array substrate etc. has been arranged, and it has the opposite substrate with which the counterelectrode was prepared in the whole surface else [, such as a color filter and a light-shielding film,]. These TFT array substrates and an opposite substrate are stuck by the sealant in the seal field located in the perimeter of an image display field, and electrooptic material, such as liquid crystal, is pinched among both substrates. Furthermore, conductive vertical flow material is pinched between the vertical flow fields (namely, fields, such as a vertical flow pad and a corner of an opposite substrate) established in both substrates on the outside of a seal field, respectively. Wiring for supplying the counterelectrode potential which is the immobilization prepared in the TFT array substrate side, or is reversed a fixed period by flow-under besides material, and a counterelectrode are connected electrically. And at the time of actuation, it is constituted by the thing (for example, the orientation condition of liquid crystal is changed) corresponding to a pixel electrode for which driver voltage is generated and each electrooptic material part is driven between a pixel electrode and a counterelectrode for every pixel so that a display action may be performed.
[0003] For example, in JP,62-89024,A, JP,11-64874,A, and JP,11-202366,A, the technique of preparing a sealant in the seal field which surrounds a liquid crystal layer along with four sides of a substrate, and preparing vertical flow material in the vertical flow field of four corners of a substrate is indicated. And generally, although a sealant consists of photo-setting resins without conductivity etc. and vertical flow material consists of conductive ingredients, according to JP,62-89024,A, the sealant of a seal field and the vertical flow material prepared in a vertical flow field are formed from the same conductive ingredient among these official reports, respectively. Thereby, a sealant and vertical flow material can be formed at the same process, and it is supposed that simplification of a manufacture process can be attained.
[0004] On the other hand, in this kind of electro-optic device, when it has the large-sized image display field of about 20cm or more of vertical angles, for example, the gap material of the shape of the shape of a bead for controlling the gap between both substrates in electrooptic material, such as liquid crystal arranged to an image display field, and a fiber is sprinkled (that is, since gap material is not visible in an image, it is satisfactory). On the other hand, in the case of the small

electro-optic device which has the image display field of about 2cm or less of vertical angles, for example, it is common that the gap material for controlling the gap between both substrates in a sealant is mixed (that is, he is trying for gap material to be unable to be seen in an image).
[0005]
[Problem(s) to be Solved by the Invention] However, in above-mentioned JP,62-89024,A, since a sealant also has conductivity, there is a trouble that the short-circuit between wiring occurs frequently in a seal field, and commercial production is very difficult in practice. If such contact takes place, various wiring will be made for the cause of making these various wiring short-circuiting not to become, even if it contacts various wiring which breaks the insulator layer on a TFT array substrate, and is in the bottom of it in case gap material without the conductivity mixed in it is adhesion if it is more specifically a sealant without conductivity, but according to this official report, to short-circuit by gap material, since gap material has conductivity.
[0006] On the other hand, it is supposed, for example that it is required to separate vertical flow material from a substrate edge beyond predetermined distance in order to prevent the short-circuit between vertical substrates in above-mentioned JP,11-64874,A, and in above-mentioned JP,11-202366,A, in order to set the whole, comparatively high counterelectrode of electric resistance as uniform potential, it is supposed that it is required to prepare wiring which reaches the vertical flow field which is along with the periphery of an image display field in four corners on the substrate outside an image display field. Therefore, according to these official reports, since it is necessary to establish a vertical flow field in the outside of a seal field, attaining miniaturization of a substrate or enlargement of an image display field to a substrate has fundamentally the trouble of being difficult.
[0007] In addition, if it is going to attain miniaturization of a substrate, or enlargement of an image display field by making a vertical flow field small to this problem, the dependability of the vertical flow [itself] will fall. Or if it is going to attain miniaturization of a substrate, or enlargement of an image display field by making a seal field small to this problem, the dependability of the lamination of both substrates and the dependability of the gap control between substrates will fall.
[0008] It carries out providing the electro-optic device which can extend an image-display field relatively to a substrate it is possible to attain simplification of a configuration of to start the configuration concerning the sealant which this invention is made in view of the above-mentioned trouble, and sticks the substrate of a pair, and the vertical flow between the substrates of a pair, and it is possible to raise the dependability of this vertical flow, and possible [attaining the miniaturization of a substrate moreover], and its manufacture approach as a technical problem.
[0009]
[Means for Solving the Problem] In order that the electro-optic device of this invention may solve the above-mentioned technical problem, it comes to pinch electrooptic material between the 1st and 2nd substrates of a pair. It has the sealant which carries out phase adhesion of said 1st and 2nd substrates in the seal field which saw superficially and met to those perimeters between said 1st and 2nd substrates. Two or more pixel electrodes arranged to the image display field which saw superficially and was surrounded in said seal field on said 1st substrate. It has wiring extended outside said seal field from the inside of said image display field, and the vertical flow pad arranged in said seal field. On said 2nd substrate, it has the counterelectrode which has the vertical flow section which opposite arrangement is carried out at said pixel electrode, and counters said vertical flow pad, and the part by which said sealant has been arranged at least between said vertical flow pad and said vertical flow section consists of a conductive ingredient.
[0010] According to the electro-optic device of this invention, at the time of the actuation, signals, such as a picture signal, are supplied to wiring formed on the 1st substrate, and signals, such as a picture signal, are supplied to it at a pixel electrode. In parallel to this, signals, such as immobilization or an opposite potential signal reversed periodically, are supplied to the counterelectrode formed on the 2nd substrate through a vertical flow pad and the vertical flow section. Therefore, according to these signals, driver voltage is impressed between a pixel

electrode and a counterelectrode for every pixel, the electrooptic material among both drives (the orientation condition of liquid crystal changed by impression of driver voltage), and electro-optics-image display is performed. The part which consists of a conductive ingredient here among the sealants which carry out phase adhesion of the 1st and 2nd substrates in a seal field especially is arranged between a vertical flow pad and the vertical flow section, and functions as vertical flow material between these. That is, it becomes possible [the part which can include a vertical flow field all over a seal field compared with securing a vertical flow field in the outside of a seal field, and arranging conductive vertical flow material apart from a sealant to this vertical flow field] to attain miniaturization of a substrate, or enlargement of an image display field to a substrate like the various conventional techniques mentioned above. On the contrary, only the part which does not need to prepare a vertical flow field apart from a seal field becomes possible [securing a seal field greatly], and can realize lamination of both more reliable substrates. Furthermore, it becomes possible by operating a part of sealant [at least] also as vertical flow material to attain simplification of an equipment configuration and its manufacture process.

[0011] Furthermore, since a vertical flow pad comes to the maximum upper layer on the 1st substrate, it can reduce possibility of making the wiring by which laminating formation is carried out caudad disconnecting or short-circuiting by the sealant (for example, gap material contained in it), by existence of the vertical flow pad concerned again. And if a vertical flow pad is greatly formed in a seal field, a more reliable vertical flow is realizable. These results, the stable drive of the counterelectrode can be carried out by reliable vertical flow, and the block ghost in the image finally displayed can be reduced.

[0012] It becomes possible it is possible to attain simplification of a configuration of to start the configuration and vertical flow concerning a sealant according to the electro-optic device of this invention the above result, and it is possible to raise the dependability of the lamination of this vertical flow and both substrates, and possible [attaining the miniaturization of a substrate moreover] to extend an image display field relatively to a substrate.

[0013] In the mode of 1 of the electro-optic device of this invention, said vertical flow pad occupies at least one of three sides of said seal fields predetermined.

[0014] According to this mode, since one side, two sides, or three sides in a seal field are occupied, like the conventional technique mentioned above, as compared with the case where an island-shape vertical flow pad is formed in four corners of a substrate, a vertical flow pad will form a vertical flow pad greatly far, can realize a far reliable vertical flow, and can carry out the stable drive of the counterelectrode good. moreover, possibility of making wiring by which laminating formation is carried out under the predetermined side, then (namely, -- if the sealant of electric insulation is arranged to the side which is not the predetermined side) the sealant in the side in which wiring to outside a seal field from an image display field is not prepared, and the side which has the high wiring structure of a mechanical strength relatively disconnecting or short-circuiting by the sealant can be reduced. Furthermore, it also becomes easy by forming a vertical flow pad per side to mix gap material and to control the gap between substrates in a sealant.

[0015] Said vertical flow pad may consist of this mode so that it may be formed the side in which the inlet for pouring in said electrooptic material among the neighborhoods which constitute said seal field is not established.

[0016] Thus, if constituted, the side in which the inlet for pouring in electrooptic material, such as liquid crystal, is not established, a vertical flow pad will be formed and a vertical flow pad will not be formed the side in which the starting inlet is established. Therefore, if the sealant of electric insulation is arranged to the side in which the inlet was established, possibility of making wiring by which laminating formation is carried out under the sealant disconnecting or short-circuiting by the sealant can be reduced. For example, it becomes much more advantageous, when reducing the configuration which prepares positively wiring extended outside a seal field from an image display field the side in which the inlet was established then the starting open circuit, or short-circuit.

[0017] In other modes of the electro-optic device of this invention, the gap material which controls the gap between said 1st and 2nd substrates is mixed in said sealant.

[0018] According to this mode, the gap between substrates is controllable by the gap material mixed in the sealant. Therefore, in a small electro-optic device, degradation of the display image by sprinkling gap material in electrooptic material can be prevented. And even if it mixes gap material in a sealant in this way especially, since possibility in a seal field of making it disconnecting or short-circuiting can be reduced by gap material with the electro-optic device of this invention like the above-mentioned, it is advantageous.

[0019] In this mode, said gap material may consist of a conductive particle in the sealant part arranged between said vertical flow pad and said vertical flow section at least.

[0020] Thus, if constituted, by the gap material which consists of a conductive particle, the conductivity in the sealant part arranged between a vertical flow pad and the vertical flow section can be raised, and this sealant part can be operated as vertical flow material.

[0021] In this case, said conductive particle may consist of a particle of the shape of the shape of a bead by which metal plating was carried out, and a fiber further.

[0022] Thus, if constituted, the sealant part arranged between a vertical flow pad and the vertical flow section can be operated as vertical flow material by, for example, using the conductive particle which carried out nickel gold plate to SiO2 ball, SiO2 fiber, etc. as gap material which has conductivity.

[0023] In other modes of the electro-optic device of this invention, the metal powder is mixed in the part arranged between said vertical flow pad and said vertical flow section at least among said sealants.

[0024] According to this mode, by the metal powder, the conductivity in the sealant part arranged between a vertical flow pad and the vertical flow section can be raised, and this sealant part can be operated as vertical flow material. In addition, it cannot be overemphasized that the gap material which consists of a conductive particle like the above-mentioned may be mixed in addition to mixing a metal powder.

[0025] In other modes of the electro-optic device of this invention, said sealant contains said conductive ingredient over said all seal fields.

[0026] According to this mode, it becomes possible by operating the whole sealant also as vertical flow material to attain simplification of an equipment configuration and its manufacture process.

[0027] It consists of an electric insulation ingredient in the field which consists of said conductive ingredient partially at least, and does not counter said vertical flow pad among said seal fields in the field in which said sealant counters said vertical flow pad among said seal fields in other modes of the electro-optic device of this invention.

[0028] According to this mode, in the field which counters a vertical flow pad, it becomes possible by operating a part of sealant also as vertical flow material to attain simplification of an equipment configuration and its manufacture process. And in the field which does not counter a vertical flow pad, since a sealant consists of an electric insulation ingredient, it can reduce possibility of making wiring by which laminating formation is carried out under the sealant part which consists of this electric insulation ingredient disconnecting or short-circuiting by the sealant part concerned.

[0029] In other modes of the electro-optic device of this invention, the front face of said vertical flow pad formed in said seal field is formed on the same flat surface as the front face of the insulator layer in said seal field.

[0030] this voice -- if it depends like -- the inside of a seal field -- a vertical flow pad -- for example, CMP (Chemical Mechanical Polishing: chemical mechanical polishing) processing -- or by being embedded in the slot the substrate or the interlayer insulation film was trenched, flattening is carried out so that the front face of a vertical flow pad and the front face of the insulator layer in a seal field may be formed on the same flat surface. Therefore, when mixing gap material and controlling the gap between substrates in a sealant, high control of precision is attained on a flat seal field.

[0031] In other modes of the electro-optic device of this invention, to the front face of the insulator layer in said seal field, the front face of said vertical flow pad formed in said seal field prepares a level difference, and is formed, and in said sealant, in order to control the gap

between said 1st and 2nd substrates, gap material with the path respectively corresponding to the gap of the field of said vertical flow pad and the field of said insulator layer is mixed.
[0032] According to this mode, since flattening of the vertical flow pad is not carried out in the seal field, when the gap material of path regularity is temporarily mixed in a sealant, it becomes very difficult to control the gap between substrates with a sufficient precision according to the irregularity of a vertical flow pad. Furthermore, possibility that wiring will disconnect or short-circuit by the gap material which contacts locally in the field which serves as a convex relatively in a seal field will become high. However, according to this mode, in the sealant, in order to control the gap between the 1st and 2nd substrates, gap material with the path respectively corresponding to the gap of the field of a vertical flow pad and the field of an insulator layer is mixed. That is, when the gap in the seal field of a vertical flow pad is small (that is, a vertical flow pad is a convex in a seal field), the path of the gap material arranged on a vertical flow pad is small set up as compared with the path of the gap material which is not arranged on a vertical flow pad. On the other hand, when the gap in the seal field of a vertical flow pad is large (that is, a vertical flow pad is concave in a seal field), the path of the gap material arranged on a vertical flow pad is greatly set up as compared with the path of the gap material which is not arranged on a vertical flow pad. Therefore, it becomes possible for a gap to become possible [arranging the height of the top-most vertices of the gap material arranged on the seal field which is not fixed], and to control the gap between substrates by changing the path of gap material in any case good by the gap material in a sealant. And when gap material contacts locally in the field which serves as a convex relatively in a seal field, possibility that wiring will disconnect or short-circuit can be reduced.
[0033] In the border area from which said gap changes among said seal fields in the field of said vertical flow pad, and the field of said insulator layer, you may constitute from this mode so that the sealant with which the gap material of the minor diameter corresponding to the field where a gap is small was mixed by the border area where a gap is large may be arranged.
[0034] Thus, if constituted, in the border area where the gap between substrates in a seal field changes, possibility that the gap material of a major diameter will enter towards a narrow side from a side with the relatively large gap between substrates can be reduced. That is, when the gap material of the major diameter for extensive gaps contacts locally in a narrow gap part, possibility that wiring will disconnect or short-circuit can be reduced. On the other hand, in the border area where the gap between substrates in a seal field changes, that the gap material of a minor diameter enters does not pose a problem from a side with the relatively narrow gap between substrates at all on most or practical use towards a large side.
[0035] In other modes of the electro-optic device of this invention, said sealant comes to contain thermosetting resin or heat, and a photo-setting resin.
[0036] According to this mode, in the manufacture process of the electro-optic device concerned, the lamination of both reliable substrates is realizable by stiffening with heating the sealant which comes to contain thermosetting resin or heat, and a photo-setting resin. Since a vertical flow pad exists in the 1st substrate side in a seal field in this invention and it is incidentally hard to perform an optical exposure a little, if the sealant which consists of a photo-setting resin temporarily is used, it is difficult some (it is, if possible) to stiffen a sealant. Therefore, it is advantageous like this mode to adopt the sealant which comes to contain thermosetting resin or heat, and a photo-setting resin.
[0037] In order to solve the above-mentioned technical problem, the manufacture approach of the electro-optic device of this invention is the manufacture approach of an electro-optic device of manufacturing the electro-optic device (the various modes also being included) of this invention mentioned above, and includes the process which forms said pixel electrode, said wiring, and said vertical flow pad on said 1st substrate, the process which forms said counterelectrode on said 2nd substrate, and the process which carries out phase adhesion of said 1st substrate and said 2nd substrate by said sealant.
[0038] According to the manufacture approach of the electro-optic device of this invention, the vertical flow material which carries out the vertical flow of a vertical flow pad and the vertical flow section can be formed from the part which becomes carrying out phase adhesion of the 1st

substrate with which the vertical flow pad was formed, and the 2nd substrate with which the counterelectrode which has the vertical flow section was formed by the sealant, and coincidence from a conductive ingredient among sealants. That is, compared with the case where the process which sticks both substrates, and the process which takes a vertical flow are performed separately, simplification of a manufacture process can be attained and the electro-optic device of this invention mentioned above according to such a simplified manufacture process can be manufactured comparatively easily.
[0039] In the mode of 1 of the manufacture approach of the electro-optic device of this invention, it has further the process which carries out flattening of said vertical flow pad.
[0040] this voice -- performing for example, CMP processing for a vertical flow pad, if it depends like -- or since flattening is carried out by trenching and embedding a slot at a substrate or an interlayer insulation film, when mixing gap material and controlling the gap between substrates in a sealant, high control of precision is attained on a flat seal field.
[0041] In other modes of the manufacture approach of the electro-optic device of this invention, the process which carries out phase adhesion by said sealant includes the process which draws the sealant with which the gap material of the process which draws the sealant with which the gap material of the 1st path was mixed by the seal field part which counters said vertical flow pad by the dispenser of 1, and the 2nd path which is different from said 1st path into the seal field part which does not counter said vertical flow pad was mixed by other dispensers.
[0042] According to this mode, to the seal field part which counters a vertical flow pad, the sealant with which the gap material of the 1st path was mixed by the dispenser of 1 is drawn, and the sealant with which the gap material of the 2nd path which differs from the 1st path by other dispensers was mixed is drawn to the seal field part which does not counter a vertical flow pad. Therefore, in the seal field which is irregular with existence of a vertical flow pad, the electro-optic device of this invention in the mode which controls the gap between substrates by changing the path of gap material according to this irregularity good can be manufactured comparatively easily.
[0043] In other modes of the manufacture approach of the electro-optic device of this invention, the process which carries out phase adhesion by said sealant includes the process which draws the sealant with which conductive gap material was mixed by the seal field part which counters said vertical flow pad by the dispenser of 1, and the process which draws the sealant with which the gap material of electric insulation was mixed by the seal field part which does not counter said vertical flow pad by other dispensers.
[0044] According to this mode, to the seal field part which counters a vertical flow pad, the sealant with which conductive gap material was mixed by the dispenser of 1 is drawn, and the sealant with which the gap material of electric insulation was mixed by other dispensers is drawn to the seal field part which does not counter a vertical flow pad. Therefore, the electro-optic device of this invention in the mode which prevents the open circuit or short-circuit of wiring by gap material can be manufactured comparatively easily by making gap material into conductivity only in the part where a vertical flow pad exists, taking a vertical flow.
[0045] In other modes of the manufacture approach of the electro-optic device of this invention, the process which carries out phase adhesion by said sealant includes the process heated to the sealant which comes to contain thermosetting resin or heat, and a photo-setting resin.
[0046] According to this mode, the phase adhesion of both the substrates can be carried out by heating to the sealant which comes to contain thermosetting resin or heat, and a photo-setting resin. That is, the lamination of both reliable substrates is obtained by the sealant.
[0047] Although it is incidentally difficult to stiffen the sealant which consists of a photo-setting resin since a vertical flow pad exists in the 1st substrate side in a seal field in this invention, and it is hard to perform an optical exposure, it is possible to stiffen a photo-setting resin, carrying out the mask of the image display field, and avoiding degradation of the electrooptic material by optical exposure etc. by carrying out an optical exposure in this case.
[0048] Moreover, it is characterized by equipping the projection mold indicating equipment of this invention with the light source, the light valve which becomes with the electro-optic device of this invention, the light guide section material which carries out the light guide of the light

generated from said light source to said light valve, and the incident light faculty material which projects the light modulated with said light valve, in order to solve the above-mentioned technical problem.

[0049] Such an operation and other gains of this invention are made clear from the gestalt of the operation explained below.

[0050]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. The following operation gestalten apply the electro-optic device of this invention to liquid crystal equipment.

[0051] (The whole electro-optic device configuration) The whole electro-optic device configuration in the operation gestalt of this invention is first explained with reference to drawing 3 from drawing 1 . Here, the liquid crystal equipment of the drive circuit built-in TFT active-matrix drive method which is an example of an electro-optic device is taken for an example.

[0052] Drawing 1 is the top view which looked at the TFT array substrate from the opposite substrate side with each component formed on it, and drawing 2 is the H-H' sectional view of drawing 1 . Moreover, drawing 3 is the top view extracting and showing the vertical flow pad and sealant which were formed on the TFT array substrate among the various configuration members shown in drawing 1 .

[0053] In drawing 1 and drawing 2 , opposite arrangement of the TFT array substrate 10 and the opposite substrate 20 is carried out with the electro-optic device concerning this operation gestalt. The liquid crystal layer 50 is enclosed between the TFT array substrate 10 and the opposite substrate 20, and the TFT array substrate 10 and the opposite substrate 20 are mutually pasted up by the sealant 52 prepared in the seal field located in the perimeter of image display field 10a.

[0054] With this operation gestalt, after especially the sealant 52 consists of heat-curing resin, heat and photo-curing resin, photo-curing resin, ultraviolet-rays hardening resin, etc. and is applied on the TFT array substrate 10 in a manufacture process in order that it may stick both substrates as a function of sealant original first for example, it is stiffened by heating, heating and an optical exposure, an optical exposure, UV irradiation, etc. Furthermore, a sealant 52 functions also as vertical flow material by being pinched between the vertical flow pad 106 prepared in the seal field on the TFT array substrate 10, and vertical flow section 21a located in the edge of a counterelectrode 21 prepared on the opposite substrate 20. That is, an electric flow can be taken between the TFT array substrate 10 and the opposite substrate 20 by the sealant 52.

[0055] In such a sealant 52, gap material, such as a glass fiber for making spacing between both substrates (gap between substrates) into a predetermined value or a glass bead, is mixed. That is, the electro-optic device of this operation gestalt is small as an object for the light valves of a projector, and suitable for performing an enlarged display. However, the electro-optic device concerned is large-sized like a liquid crystal display or a liquid crystal television, and as long as it is liquid crystal equipment which performs an actual size display, such gap material may be contained in the liquid crystal layer 50. And especially with this operation gestalt, gap material consists of a conductive particle into the part of the sealant 52 which is arranged between the vertical flow pad 106 and vertical flow section 21a at least, and functions as vertical flow material. It more specifically consists of SiO2 particle of the shape of the shape of a bead to which nickel gold plate was performed, and a fiber. The configuration and the operation effectiveness of the vertical flow pad 106 are behind explained in full detail from drawing 3 in such sealant 52 list with reference to drawing 7 to drawing 5 and drawing 13 .

[0056] In drawing 1 and drawing 2 , the frame 53 of the protection-from-light nature which specifies image display field 10a is formed in the opposite substrate 20 side in parallel to the inside of the seal field where the sealant 52 has been arranged. It cannot be overemphasized that a frame 53 may be formed in the TFT array substrate 10 side. The data-line drive circuit 101 and the external circuit connection terminal 102 are formed in the lateral part of the seal field where the sealant 52 has been arranged among the boundary regions which spread around an image display field along with one side of the TFT array substrate 10, and the scanning-line

drive circuit 104 is established in it along with two sides which adjoin this one side. Furthermore, two or more wiring 105 for connecting between the scanning-line drive circuits 104 established in the both sides of image display field 10a is formed in one side in which the TFT array substrate 10 remains.

[0057] In drawing 2 , the orientation film is formed on pixel electrode 9a after wiring of TFT for pixel switching, the scanning line, the data line, etc., etc. was formed on the TFT array substrate 10. On the other hand, on the opposite substrate 20, the orientation film is formed at a part for the management of the maximum besides a counterelectrode 21. Moreover, the liquid crystal layer 50 consists of liquid crystal which mixed the pneumatic liquid crystal of a kind or some kinds, and takes a predetermined orientation condition between the orientation film of these pairs.

[0058] With this operation gestalt, the sampling circuit 301 is established in the field on the TFT array substrate 10 under a frame 53. The sampling circuit 301 is constituted so that the picture signal on a picture signal line may be sampled according to the sampling circuit driving signal supplied from the data-line drive circuit 101 and the data line may be supplied.

[0059] Especially with this operation gestalt, as made an extract and shown in drawing 1 and drawing 3 , the vertical flow pad 106 is formed in the seal field which counters three sides except the side in which the liquid crystal inlet 108 was formed among the neighborhoods of the sealant 52 whose flat surface configuration is a rectangle in general equal to the opposite substrate 20, and a more reliable vertical flow can be taken with the large vertical flow pad of area as compared with a traditional vertical flow pad. However, as are shown in drawing 4 , and vertical flow pad 106' may be prepared in two sides of the both sides of the side in which the liquid crystal inlet 108 was formed or it is shown in drawing 5 , vertical flow pad 106" may be prepared in one side which counters the side in which the liquid crystal inlet 108 was formed.

[0060] In addition, although such a vertical flow pad is formed from metals of low resistance, such as for example, aluminum (aluminum) film and Cr (chromium), since the area in contact with the sealant 52 as vertical flow material is comparatively large, it is also more possible than aluminum film to form from the conductive ingredient of the metal of low resistance or a nonmetal.

[0061] (Circuitry of an electro-optic device, and actuation) The circuitry and actuation in the electro-optic device constituted like the above next are explained with reference to drawing 6 . Drawing 6 is the block diagram showing the equal circuit and circumference circuits in two or more pixels formed in the shape of [which constitutes the image display field of an electro-optic device] a matrix, such as various components and wiring.

[0062] In drawing 6 , TFT30 for carrying out switching control of pixel electrode 9a and the pixel electrode 9a concerned, respectively is formed in two or more pixels formed in the shape of [which constitutes the image display field of the electro-optic device in this operation gestalt] a matrix, and data-line 6a to which a picture signal is supplied is electrically connected to the source concerned of TFT30.

[0063] It connects with the drain of each switching element with which the end (it is a lower limit in drawing 6) of data-line 6a becomes the boundary region which is outside image display field 10a from TFT of a sampling circuit 301. On the other hand, the picture signal line 115 is connected to the source of TFT of a sampling circuit 301 through the drawer wiring 116. The sampling circuit drive signal line 114 connected to the data-line drive circuit 101 is connected to the gate of TFT of a sampling circuit 301. And the picture signals S1, S2, --, Sn on the picture signal line 115 are constituted so that it may be sampled by the sampling circuit 301 and each data-line 6a may be supplied according to a sampling circuit driving signal being supplied through the sampling circuit drive signal line 114 from the data-line drive circuit 101.

[0064] Thus, the picture signals S1, S2, --, Sn written in data-line 6a may be supplied to line sequential, and you may make it supply them to this order for every group to two or more data-line 6a which adjoin each other.

[0065] Moreover, scanning-line 3a is electrically connected to the gate of TFT30 for pixel switching, and it consists of predetermined timing so that the scan signals G1, G2, --, Gm may be impressed to scanning-line 3a by the scanning-line drive circuit 104 in pulse line sequential at

this order. It connects with the drain of TFT30 electrically, and pixel electrode 9a writes in the picture signals S1, S2, --, Sn supplied from data-line 6a in TFT30 which is a switching element when only a fixed period closes the switch to predetermined timing. Fixed period maintenance of the picture signals S1, S2, --, Sn of the predetermined level written in the liquid crystal as an example of electrooptic material through pixel electrode 9a is carried out between the counterelectrodes 21 formed in the opposite substrate. When the orientation and order of molecular association change with the potential level impressed, liquid crystal modulates light and enables a gradation display. The transmission to incident light decreases according to the electrical potential difference impressed in the unit of each pixel when it was in no MARI White mode, if it is in NOMA reeve rack mode, the transmission to incident light will be increased according to the electrical potential difference impressed in the unit of each pixel, and light with the contrast according to a picture signal will carry out outgoing radiation from an electro-optic device as a whole. Here, in order to prevent the held picture signal leaking, storage capacitance 70 is added to the liquid crystal capacity and juxtaposition which are formed between pixel electrode 9a and a counterelectrode 21. It ranks with scanning-line 3a, and while the fixed potential side capacity electrode of storage capacitance 70 is included, the capacity line 300 fixed to constant potential is formed.

[0066] In addition, on the TFT array substrate 10, the inspection circuit for inspecting the precharge circuit which precedes the precharge signal of a predetermined voltage level with a picture signal, and supplies it to two or more data-line 6a respectively, the quality of the electro-optic device concerned at the manufacture middle or the time of shipment, a defect, etc. in addition to these data-line drive circuits 101, the scanning-line drive circuit 104, and sampling circuit 301 grade etc. may be formed.

[0067] (Detail of a sealant and a vertical flow pad) Next, with reference to drawing 9 , explanation is further added to the sealant 52 list which functions also as vertical flow material shown in drawing 5 from drawing 1 from drawing 7 about the configuration and the operation effectiveness of the vertical flow pad 106. It is the fragmentary sectional view drawing 7's expanding C1 part in drawing 2 here, and showing it here, drawing 8 is the fragmentary sectional view expanding and showing C2 part in drawing 2 , and drawing 9 is the B-B' sectional view of drawing 1 .

[0068] In drawing 7 , like the after-mentioned, laminating formation of the substrate insulator layer 12 which carries out layer insulation of scanning-line 3a formed in a picture element part, data-line 6a, the TFT, etc., the 1st interlayer insulation film 41, the 2nd interlayer insulation film, the 3rd interlayer insulation film 43, and the 4th interlayer insulation film 44 is carried out on the TFT array substrate 10, and pixel electrode 9a and the orientation film 16 are formed on the 4th interlayer insulation film 44. Moreover, a sampling circuit 301 (refer to drawing 6) is formed on the 1st interlayer insulation film 41, the drawer wiring 116 (refer to drawing 3) which consists of the same film (for example, aluminum film) as data-line 6a is formed between the 2nd interlayer insulation film 42 and the 3rd interlayer insulation film 43, and it connects with a sampling circuit 301. On the other hand, the frame 53 and the counterelectrode 21 are formed on the opposite substrate 20. And between the maximum upper slack orientation film 16 of the TFT array substrate 10, and the lowest layer slack orientation film 22 of the opposite substrate 20, the sealant 52 with which it comes to mix the gap material 201 in resin 200 is arranged.

[0069] on the other hand, drawing 8 -- setting -- the TFT array substrate 10 -- the maximum -- the upper layer -- the lowest of the vertical flow pad 106 and the opposite substrate 20 -- a layer -- between vertical flow section 21a which consists of a edge of a counterelectrode 21, the sealant 52 with which it comes to mix the gap material 202 in resin 200 is arranged. Here, unlike the case of the seal field shown by drawing 7 , in the case of the seal field shown in drawing 8 , the gap material 202 has conductivity, and the sealant 52 is functioning on it also as vertical flow material.

[0070] On the other hand, in the case of drawing 7 , even if the gap material 201 runs through interlayer insulation films 44 and 43 even the drawer wiring 116 by which laminating formation is carried out caudad by not giving conductivity to the gap material 201, possibility that this will pull out, and wiring 116 grade will disconnect or short-circuit can be reduced.

[0071] As shown in drawing 9 , the vertical flow pad 106 is 1 on the TFT array substrate 10, or

two or more parts, to the counterelectrode 21, is immobilization or is connected to the counterelectrode signal wiring 117 (for example, wiring which consists of aluminum film of low resistance etc. like the case of the drawer wiring 116) for supplying the counterelectrode potential signal reversed a predetermined period through the contact hole 118. And preferably, as shown in drawing 9 , flattening of the vertical flow pad 106 is carried out with the 4th interlayer insulation film 44. Such flattening processing is explained further later in the place of a manufacture process.

[0072] As shown in drawing 9 from drawing 7 , with this operation gestalt, the part which consists of a conductive ingredient by the conductive gap material 202 being included among the sealants 52 which carry out phase adhesion of both the substrates in a seal field is arranged among vertical flow pad 106 and vertical flow section 21a, and functions as vertical flow material between these. Therefore, only the part which can include a vertical flow field all over a seal field can miniaturize the TFT array substrate 10, or can enlarge an image display field to a TFT array substrate. On the contrary, only the part which does not need to prepare a vertical flow field apart from a seal field can secure a seal field greatly. for this reason -- very much -- dependability -- both substrates are stuck highly. Furthermore, simplification of an equipment configuration and its manufacture process can be attained by operating a part of sealant [at least] 52 also as vertical flow material.

[0073] Next, the various deformation gestalten of the operation gestalt mentioned above are explained with reference to drawing 13 from drawing 10 . It is a sectional view [here] diagrammatic [showing the situation of the gap material in near the boundary of the field in which the vertical flow pad was formed among the seal fields in the operation gestalt which drawing 10 mentioned above, and the field in which the vertical flow pad is not formed]. Drawing 11 to drawing 13 is the diagrammatic sectional view having shown the situation of the gap material in near the boundary of the field in which the vertical flow pad was formed among the seal fields in a deformation gestalt, and the field in which the vertical flow pad is not formed, respectively.

[0074] As first shown in drawing 10 , let the sealant 52 be electric insulation by facing across a border area in the case of the operation gestalt mentioned above, making the sealant 52 into conductivity and mixing the gap material 201 of electric insulation in resin 200 by the side in which the vertical flow pad 106 is not formed by mixing the conductive gap material 202 in resin 200 in the side in which the vertical flow pad 106 was formed. And flattening of the vertical flow pad 106 is carried out, and the path of these gap material 201 and 202 is substantially made the same. According to the operation gestalt mentioned above these results, in addition to the function of sealant original, the function as vertical flow material can also be given to a sealant 52, and the gap between substrates can be controlled with a sufficient precision to coincidence.

[0075] In the case of the deformation gestalt shown in drawing 11 , it faces across a border area, and, in addition to the conductive gap material 202 being mixed, conductive silver dust 203 is mixed in resin 200 in the side in which the vertical flow pad 106 was formed. By these, better conductivity can be given to a sealant 52. About other configurations, it is the same as that of the operation gestalt shown in drawing 9 from drawing 1 .

[0076] In the case of the deformation gestalt shown in drawing 12 , since flattening of the vertical flow pad 106 is not carried out, the field in which the vertical flow pad 106 was formed among seal fields is made higher than the field in which the vertical flow pad 106 is not formed. Therefore, if the gap material of the diameter of the same is mixed on both sides of this boundary, since a result as which gap material functions only on the vertical flow pad 106 is brought, gap control will become incorrectness. However, in the case of the deformation gestalt shown in drawing 12 , on the vertical flow pad 106 which is high relatively, it is a minor diameter and conductive gap material 202S is mixed, it is a major diameter and gap material 201L of electric insulation is mixed by the seal field without the vertical flow pad 106 which is low relatively. And only the part of the height h1 of the vertical flow pad 106 sets up small the path D1 of gap material 202S of a minor diameter preferably rather than the path D2 of gap material 201L of a major diameter (that is, it is set as D1=D2-h1). According to the deformation gestalt shown in drawing 12 these results, even if it does not perform flattening processing to the

vertical flow pad 106, the gap between substrates is controllable with a sufficient precision. About other configurations, it is the same as that of the operation gestalt shown in drawing 9 from drawing 1 .

[0077] In the case of the deformation gestalt shown in drawing 13 , since flattening of the vertical flow pad 106 is not carried out, the field in which the vertical flow pad 106 was formed among seal fields is made lower than the field in which the vertical flow pad 106 is not formed. Therefore, if the gap material of the diameter of the same is mixed on both sides of this boundary, since a result as which gap material functions only in the field in which the vertical flow pad 106 is not formed is brought, the dependability of gap control will fall. However, in the case of the deformation gestalt shown in drawing 13 , on the vertical flow pad 106 which is low relatively, it is a major diameter and conductive gap material 202L is mixed, it is a minor diameter and gap material 201S of electric insulation is mixed by the seal field in which the vertical flow pad 106 which is high relatively is not formed. And only the part of the height h2 of the vertical flow pad 106 sets up greatly the path D3 of gap material 202L of a major diameter preferably rather than the path D4 of gap material 201S of a minor diameter (that is, it is set as D3=D4+h2). According to the deformation gestalt shown in drawing 13 these results, even if it does not perform flattening processing to the vertical flow pad 106, the gap between substrates is controllable with a sufficient precision. Furthermore, with the deformation gestalt shown in drawing 13 , gap material 201S of the minor diameter of electric insulation has entered in the border area where the gap between substrates changes on the gap material 201 vertical flow pad 106 with the gap between substrates large [are constituted so that the sealant 52 with which S was mixed may be arranged, and / drawing 13] of a minor diameter. Thus, if constituted, in the border area where the gap between substrates changes, gap material 202L of a major diameter can reduce possibility of entering into a side with the narrow gap between substrates. That is, when gap material 202L of a major diameter contacts locally in a narrow gap part, possibility that wiring under it will disconnect or short-circuit can be reduced. About other configurations, it is the same as that of the operation gestalt shown in drawing 9 from drawing 1 .

[0078] In addition, a sealant 52 may be formed from the same ingredient over all the seal fields, without changing a sealant 52 near a boundary, as shown in drawing 13 from drawing 10 (namely, gap material, the same, same conductive resin, or the same, same conductive conductive resin etc.). Thus, if constituted, an equipment configuration and its manufacture process can be simplified by operating the sealant 52 whole also as vertical flow material.

[0079] (Configuration in the image display field of an electro-optic device) Next, the configuration in the image display field of the electro-optic device of the operation gestalt of this invention is explained with reference to drawing 14 and drawing 15 . Drawing 14 is a top view of two or more pixel groups where the TFT array substrate with which the data line, the scanning line, a pixel electrode, etc. were formed adjoins each other. Drawing 15 is the A-A' sectional view of drawing 14 . In addition, in order to make each class and each part material into the magnitude of extent which can be recognized on a drawing, scales are made to have differed for each class or every each part material in drawing 14 .

[0080] In drawing 14 , on the TFT array substrate of an electro-optic device, two or more transparent pixel electrode 9a (the profile is shown by dotted-line section 9a') is prepared in the shape of a matrix, and data-line 6a and scanning-line 3a are prepared respectively along the boundary of pixel electrode 9a in every direction.

[0081] Moreover, scanning-line 3a is arranged so that channel field 1a' shown in the slash field of a Fig. Nakamigi riser among semi-conductor layer 1a may be countered, and scanning-line 3a functions as a gate electrode (with this operation gestalt, especially scanning-line 3a is broadly formed in the part used as the gate electrode concerned). Thus, TFT30 for pixel switching by which opposite arrangement of the scanning-line 3a was carried out as a gate electrode is formed in the crossing part of scanning-line 3a and data-line 6a at channel field 1a', respectively.

[0082] As shown in drawing 14 and drawing 15 , storage capacitance 70 is formed by carrying out opposite arrangement of the junction layer 71 as a pixel potential side capacity electrode connected to high concentration drain field 1e (and pixel electrode 9a) of TFT30, and a part of

capacity line 300 as a fixed potential side capacity electrode through a dielectric film 75.

[0083] The capacity line 300 was seen superficially, and is extended in the shape of a stripe along with scanning-line 3a, and the part which laps with TFT30 has projected it under drawing 14 Nakagami. Such a capacity line 300 is constituted so that the 1st film which consists of conductive polish recon film of about 50nm of thickness etc., and the 2nd film which consists of metal silicide film containing the refractory metal of about 150nm of thickness etc. may have preferably the multilayer structure by which the laminating was carried out. Thus, if constituted, the 2nd film has a function as a protection-from-light layer which shades TFT30 from incident light in a TFT [besides the function as the capacity line 300 or a fixed potential side capacity electrode of storage capacitance 70]30 top.

[0084] On the other hand, bottom light-shielding film 11a is prepared in the TFT30 bottom on the TFT array substrate 10 in the shape of a grid. Bottom light-shielding film 11a consists of the metal simple substance containing at least one of refractory metals, such as Ti (titanium), Cr (chromium), W (tungsten), Ta (tantalum), Mo (molybdenum), and Pb (lead), an alloy, metal silicide, a polysilicon side, a thing that carried out the laminating of these.

[0085] And bottom light-shielding film 11a formed in the lengthwise direction in drawing 14 that the capacity line 300 extended, respectively carries out a phase crossover, and is formed in data-line 6a extended, respectively and the longitudinal direction in drawing 14 and in the shape of a grid has prescribed the opening field of each pixel.

[0086] As shown in drawing 14 and drawing 15 , data-line 6a is electrically connected to 1d of high concentration source fields through the contact hole 81 among semi-conductor layer 1a which consists of polish recon film. In addition, the junction layer which consists of the same film as the junction layer 71 mentioned above may be formed, and 1d of high concentration source fields may be electrically connected with data-line 6a through the junction layer concerned and two contact holes.

[0087] Moreover, it is installed in the perimeter from the image display field where pixel electrode 9a has been arranged, it connects with the constant source of potential electrically, and let the capacity line 300 be fixed potential. The constant source of potential of a positive supply or a negative supply supplied to the data-line drive circuit (refer to drawing 1 , drawing 3 , and drawing 6) which controls the sampling circuit which supplies the scanning-line drive circuit and picture signal for supplying the scan signal for driving TFT30 to scanning-line 3a as such a constant source of potential to data-line 6a is sufficient, and the constant potential supplied to the counterelectrode 21 of the opposite substrate 20 is also available. Furthermore, in order to avoid that the potential fluctuation does a bad influence to TFT30 also about bottom light-shielding film 11a prepared in the TFT30 bottom, it is good to install in the perimeter from an image display field, and to connect with the constant source of potential like the capacity line 300.

[0088] Pixel electrode 9a is electrically connected to high concentration drain field 1e among semi-conductor layer 1a through contact holes 83 and 85 by relaying the junction layer 71.

[0089] The electro-optic device is equipped with the TFT array substrate 10 and the transparent opposite substrate 20 by which opposite arrangement is carried out at this in drawing 14 and drawing 15 . The TFT array substrate 10 consists of for example, a quartz substrate, a glass substrate, and a silicon substrate, and the opposite substrate 20 consists of a glass substrate or a quartz substrate.

[0090] As shown in drawing 15 , pixel electrode 9a is prepared in the TFT array substrate 10, and the orientation film 16 with which predetermined orientation processing of rubbing processing etc. was performed is formed in the bottom. Pixel electrode 9a consists of transparent conductive film, such as for example, ITO film. Moreover, the orientation film 16 consists of organic film, such as for example, polyimide film.

[0091] On the other hand, it crosses to the opposite substrate 20 all over the, the counterelectrode 21 is formed, and the orientation film 22 with which predetermined orientation processing of rubbing processing etc. was performed is formed in the bottom. A counterelectrode 21 consists of transparent conductive film, such as for example, ITO film. Moreover, the orientation film 22 consists of organic film, such as polyimide film.

[0092] You may make it prepare the light-shielding film (a light-shielding film which is the same as a frame 53, or is different) of the shape of the shape of a grid, and a stripe in the opposite substrate 20. It can prevent more certainly that the incident light from the opposite substrate 20 side invades into channel field 1a', low concentration source field 1b, and low concentration drain field 1c by the light-shielding film on the opposite substrate 20 concerned with the capacity line 300 and data-line 6a which constitute a protection-from-light field from taking such a configuration like the above-mentioned. furthermore, the field where incident light is irradiated to the light-shielding film on such an opposite substrate 20 at least -- high -- it serves to prevent the temperature rise of an electro-optic device by forming by the film [****].
[0093] Thus, between the TFT array substrates 10 and the opposite substrates 20 which have been arranged so that pixel electrode 9a and the counterelectrode 21 which were constituted may meet, the liquid crystal which is an example of electrooptic material is enclosed with the space surrounded by the sealant 52 (refer to drawing 5 from drawing 1), and the liquid crystal layer 50 is formed.
[0094] Furthermore, the substrate insulator layer 12 is formed in the bottom of TFT30 for pixel switching. The substrate insulator layer 12 has the function to prevent change of the property of TFT30 for pixel switching with the dry area at the time of polish of the front face of the TFT array substrate 10, the dirt which remains after washing, by being formed all over the TFT array substrate 10 besides the function which carries out layer insulation of TFT30 from bottom light-shielding film 11a.
[0095] In drawing 15 TFT30 for pixel switching It has LDD (Lightly Doped Drain) structure. Channel field 1a' of semi-conductor layer 1a in which a channel is formed of the electric field from scanning-line 3a and concerned scanning-line 3a, 1d list of high concentration source fields of low concentration source field 1b and low concentration drain field 1c of the insulator layer 2 containing the gate dielectric film with which scanning-line 3a and semi-conductor layer 1a are insulated, and semi-conductor layer 1a, and semi-conductor layer 1a is equipped with high concentration drain field 1e.
[0096] On scanning-line 3a, the 1st interlayer insulation film 41 with which the contact hole 83 which leads to the contact hole 81 and high concentration drain field 1e which lead to 1d of high concentration source fields was punctured respectively is formed.
[0097] On the 1st interlayer insulation film 41, the junction layer 71 and the capacity line 300 are formed, and the 2nd interlayer insulation film 42 with which the contact hole 85 which leads to the contact hole 81 and the junction layer 71 which lead to 1d of high concentration source fields was punctured respectively is formed on these.
[0098] Data-line 6a is formed on the 2nd interlayer insulation film 42, and the 3rd interlayer insulation film 43 with which the contact hole 85 which leads to the junction layer 71 was formed and which carried out flattening is formed on these.
[0099] On the 3rd interlayer insulation film 43, the 4th interlayer insulation film 44 for making the vertical flow pad 106 is formed to the seal field, and pixel electrode 9a is prepared in the top face of the 4th interlayer insulation film 44 constituted in this way.
[0100] With this operation gestalt, among the 3rd interlayer insulation film 43 and the 4th interlayer insulation film 44, flattening of one [at least] front face is carried out by CMP (Chemical Mechanical Polishing: chemical mechanical polishing) processing etc., and it reduces the poor orientation of the liquid crystal in the liquid crystal layer 50 resulting from the level difference by the various wiring and component which exist caudad.
[0101] By carrying out the laminating of many conductive layers with the operation gestalt explained above, as shown in drawing 15 Although it is easing by carrying out flattening of the front face of the 3rd interlayer insulation film 43, that a level difference arises to the field in alignment with data-line 6a and scanning-line 3a in the substrate side (namely, front face of the 3rd interlayer insulation film 43) of pixel electrode 9a Replace with this or, in addition, the TFT array substrate 10, the substrate insulator layer 12, the 1st interlayer insulation film 41, the 2nd interlayer insulation film 42, or the 3rd interlayer insulation film 43 is trenched. By performing flattening processing and grinding the level difference of the top face of the 2nd interlayer insulation film 42 by CMP processing etc. by embedding wiring and the TFT30 grade of data-line

6a etc. Or the flattening processing concerned may be performed by forming in Taira and others using organic [SOG] (Spin On Glass).
[0102] With the operation gestalt explained above, in addition, TFT30 for pixel switching Although it has LDD structure as preferably shown in drawing 15 , may have the offset structure which does not drive an impurity into low concentration source field 1b and low concentration drain field 1c, and You may be TFT of the self aryne mold which drives in an impurity by high concentration by using as a mask the gate electrode which consists of a part of scanning-line 3a, and forms the high concentration source and a drain field in self align. Moreover, although considered as the single gate structure which has arranged one gate electrode of TFT30 for pixel switching among 1d [of high concentration source fields], and high concentration drain field 1e with this operation gestalt, two or more gate electrodes may be arranged among these. Thus, if TFT is constituted above the dual gate or the triple gate, the leakage current of a joint with a channel, the source, and a drain field can be prevented, and the current at the time of OFF can be reduced.
[0103] According to the same process as TFT30 for this pixel switching, TFT which constitutes the data-line drive circuit 101, the sampling circuit 301, and the scanning-line drive circuit 104 in drawing 3 can be formed.
[0104] (Manufacture process) Explanation is added focusing on the formation process of a vertical flow pad, and the lamination process by the sealant among the manufacture processes which manufacture the electro-optic device mentioned above with reference to drawing 16 next. It is process drawing showing the cross-section structure in each process of the part here corresponding to [drawing 16 is the same with drawing 9 , and] the B-B' cross section of drawing 1 one by one.
[0105] At the process (1) of drawing 16 , the counterelectrode signal wiring 117 is first formed on the TFT array substrate 10 in a seal field from the electric conduction film of dedication in parallel to carrying out laminating formation of **** bottom light-shielding film 11a shown at drawing 14 and drawing 15 , semi-conductor layer 1a, scanning-line 3a, the capacity line 300, the data-line 6a, etc. one by one in an image display field on the TFT array substrate 10, using the same electric conduction film as these. More specifically, the counterelectrode signal wiring 117 shall be formed here from the same film (namely, for example, aluminum film) as data-line 6a (the drawer wiring 116 under the seal field shown in drawing 7 can also be formed in coincidence in this case). What is necessary is for sputtering just to perform formation of such counterelectrode signal wiring 117 (they are data-line 6a and the drawer wiring 116 to a list) by carrying out patterning by the photolithography processing after forming aluminum film in the whole surface of the 2nd interlayer insulation film 42, and etching processing. On the other hand, what is necessary is just to form [about the insulator layer between each class containing the 2nd interlayer insulation film 42 or the 3rd interlayer insulation film 43] using TEOS (tetrapod ethyl orthochromatic silicate) gas, TEB (tetrapod ethyl boat rate) gas, TMOP (tetrapod methyl oxy-FOSU rate) gas, etc. from silicate glass film, such as NSG, PSG, BSG, and BPSG, a silicon nitride film, an oxidation silicone film, etc. with ordinary pressure or a reduced pressure CVD method, for example.
[0106] Next, at a process (2), the contact hole 118 for connecting electrically the counterelectrode signal wiring 117 and the vertical flow pad 106 to the 3rd interlayer insulation film 43 is punctured with dry etching, wet etching, or such combination. Then, the vertical flow pad 106 is formed by carrying out patterning by photolithography processing and etching processing after forming aluminum film etc. in the whole surface of the 3rd interlayer insulation film 43.
[0107] Next, at a process (3), the insulator layer which consists of silicate glass film, such as NSG, PSG, BSG, and BPSG, a silicon nitride film, an oxidation silicone film, etc. the origin of the 4th interlayer insulation film 44 with ordinary pressure or a reduced pressure CVD method is formed all over the 3rd interlayer insulation film 43 including the vertical flow pad 106 as well as the 2nd interlayer insulation film 42 or the 3rd interlayer insulation film 43. Especially the thickness of this insulator layer is set up more thickly than the vertical flow pad 106.
[0108] Next, at a process (4), flattening of a seal field including the vertical flow pad 106 is

performed by grinding the insulator layer formed at the above-mentioned process (3) by CMP processing, and exposing the vertical flow pad 106. The front face of an insulator layer is more specifically ground by carrying out rotation contact of the substrate front face fixed to the spindle, passing the liquefied thriller (chemical-polishing liquid) containing a silica grain on the scouring pad fixed on the polish plate. And when the vertical flow pad 106 is exposed, the CMP processing concerned is suspended. For example, CMP processing is stopped by time management (halt). Or CMP processing is stopped by forming in the predetermined location on the TFT array substrate 10 the suitable stopper layer which has the same laminated structure as the vertical flow pad 106, for example (halt). In addition, what is necessary is for optical [which detects change of the amount of reflected lights at the time of the oscillating detection type which detects vibration generated when the friction detection type which detects change of coefficient of friction at the time of for example, a stopper layer being exposed, and a stopper layer are exposed, and a stopper layer being exposed] just to perform detection of the front face of a stopper layer.

[0109] Next, at a process (5), **** pixel electrode 9a and the orientation film 16 which were shown in drawing 14 and drawing 15 are formed in the image display field about the TFT array substrate 10. On the other hand, about the opposite substrate 20, laminating formation of a light-shielding film 53, a counterelectrode 21, and the orientation film 22 is carried out one by one.

[0110] And the TFT array substrate 10 and the opposite substrate 20 with which each class was formed as mentioned above are stuck by the sealant (refer to drawing 5 from drawing 1) so that the orientation film 16 and 22 may meet. The seal field which contains a vertical flow pad by the sealant 52 (namely, resin 200 before hardening containing the gap material 201 or the gap material 202) before hardening is drawn by the dispenser on one of substrates just before this lamination.

[0111] Under the present circumstances, the dispenser which outputs the resin 200 before hardening which contains the gap material 201 of electric insulation especially, The dispenser which outputs the resin 200 before hardening containing the conductive gap material 202 is prepared separately. If the seal field except the vertical flow pad 106 is drawn by the former and the seal field which contains the vertical flow pad 106 by the latter is drawn, the configuration (refer to drawing 13 from drawing 7) which gives conductivity only to the part which should function as vertical flow material among sealants 52 will be obtained comparatively simply.

[0112] Furthermore, the dispenser which outputs the resin 200 before hardening containing gap material 201S of a minor diameter, or 202S, The dispenser which outputs the resin 200 before hardening containing gap material 201L or 202L of a major diameter is prepared separately. If the field where the gap between substrates is narrow is drawn among seal fields by the former and the field where the gap between substrates is large is drawn among seal fields by the latter The configuration (refer to drawing 12 and drawing 13) which can perform the gap between substrates with a sufficient precision by existence of the vertical flow pad 106 also when a level difference is in a seal field is obtained comparatively simply.

[0113] Then, where both substrates are stuck by the sealant 52, a sealant (it comes to contain the resin 200 which consists of thermosetting resin or heat, and a photo-setting resin) 52 is stiffened by a heat exposure or optical exposure. With this operation gestalt, since the vertical flow pad 106 exists and it is hard to perform an optical exposure from the TFT array substrate 10 side, if a photo-setting resin or ultraviolet-rays hardenability resin is used as a sealant 52, it is necessary to perform an optical exposure from the opposite substrate 20 side. For this reason, the direction which uses the sealant 52 which consists of thermosetting or heat, and a photo-setting resin can stiffen a sealant 52 good, without being based on existence of the vertical flow pad 52, and is advantageous from a viewpoint (however, it is possible to stiffen a photo-setting resin by sufficient optical exposure from one side, carrying out the mask of the image display field, and avoiding degradation of the electrooptic material by optical exposure etc. by carrying out an optical exposure).

[0114] Then, the liquid crystal which comes to mix two or more kinds of pneumatic liquid crystals is attracted by vacuum suction through the liquid crystal inlet 108 (reference, such as drawing 1) etc., and the liquid crystal layer of predetermined thickness is formed in the space between both substrates of it.

[0115] According to the manufacture process of this invention explained above, the electro-optic device by this invention mentioned above can be manufactured comparatively easily. Under the present circumstances, the vertical flow material which carries out the vertical flow of the vertical flow pad 106 and the vertical flow section 21a can be especially formed from the part which becomes carrying out phase adhesion of the TFT array substrate 10 with which the vertical flow pad 106 was formed in the process (5) of drawing 16 , and the opposite substrate 20 with which the counterelectrode 21 which has vertical flow section 21a was formed by the sealant 52, and coincidence from a conductive ingredient among sealants 52. And in the process (4) of drawing 16 , since flattening of a seal field is performed, the gap between substrates is controllable by the gap material 201 and 202 mixed in the sealant 52 with a sufficient precision.

[0116] In addition, flattening of a seal field is replaced with the CMP processing mentioned above, or is good in a line by embedding at Mizouchi who dug the vertical flow pad 106 in either the TFT array substrate 10 or the 1st to 3rd interlayer insulation film.

[0117] in addition, since the vertical flow pad in the various gestalten shown in drawing 5 from drawing 3 can be formed only by adding some modification to patterning in the process (2) of drawing 16 , and it can form even if it does not add modification to other processes namely,, it is convenient.

[0118] You may make it connect with LSI for a drive mounted on the TAB (Tape Automated bonding) substrate instead of forming the data-line drive circuit 101 and the scanning-line drive circuit 104 on the TFT array substrate 10 electrically and mechanically through the anisotropy electric conduction film prepared in the periphery of the TFT array substrate 10 with the operation gestalt explained with reference to drawing 16 from drawing 1 above. Moreover, according to the exception of modes of operation, such as TN mode, VA (Vertically Aligned) mode, and PDLC (Polymer Dispersed LiquidCrystal) mode, and the no MARI White mode / NOMA reeve rack mode, a polarization film, a phase contrast film, a polarizing plate, etc. are respectively arranged in a predetermined direction at the side in which the outgoing radiation light of the side in which the incident light of the opposite substrate 20 carries out incidence, and the TFT array substrate 10 carries out outgoing radiation.

[0119] (Application of an electro-optic device) The electro-optic device in each operation gestalt explained above is applicable to a projector. The projector using the electro-optic device mentioned above as a light valve is explained. Drawing 17 is the top view showing the configuration of this projector. As shown in this drawing, the lamp unit 1102 which consists of sources of the white light, such as a halogen lamp, is formed in the projector 1100 interior. It is separated into the three primary colors of RGB by the mirror 1106 of three sheets and the dichroic mirror 1108 of two sheets which have been arranged inside, and the incident light injected from this lamp unit 1102 is led to the light valves 100R, 100G, and 100B corresponding to each primary color, respectively. Here, it drives, respectively with the primary signal of R, G, and B which are supplied from the processing circuit (illustration abbreviation) which that of the configuration of light valves 100R, 100G, and 100B is the same as that of the electro-optic device concerning the operation gestalt mentioned above, and inputs a picture signal. Moreover, the light of B color is drawn through the relay lens system 1121 which consists of the incidence lens 1122, a relay lens 1123, and an outgoing radiation lens 1124, in order to prevent the loss, since the optical path is long as compared with other R colors and G colors.

[0120] Now, incidence of the light modulated with light valves 100R, 100G, and 100B, respectively is carried out to a dichroic prism 1112 from three directions. And in this dichroic prism 1112, while the light of R color and B color is refracted at 90 degrees, the light of G color goes straight on. Therefore, after the image of each color is compounded, it will be projected on a color picture by the screen 1120 with a projector lens 1114.

[0121] In addition, since the light corresponding to each primary color of R, G, and B carries out incidence to light valves 100R, 100G, and 100B with a dichroic mirror 1108, as mentioned above, it is not necessary to prepare a color filter. Moreover, since it is projected on the transmission image of light valve 100G as it is to being projected after reflecting the transmission image of

light valves 100R and 100B with a dichroic mirror 1112, it has the composition of carrying out right-and-left reversal of the display image by light valves 100R and 100B to the display image by light valve 100G.

[0122] In addition, with each operation gestalt, the color filter is not prepared in the opposite substrate 20. However, the color filter of RGB may be formed in the predetermined field which counters pixel electrode 9a on the opposite substrate 20 with the protective coat. If it does in this way, the electro-optic device in each operation gestalt is applicable about the color electro-optic device of direct viewing types other than a projector, or a reflective mold. Moreover, a micro lens may be formed so that it may correspond 1 pixel on [one] the opposite substrate 20. Or it is also possible to form a color filter layer in the bottom of pixel electrode 9a which counters RGB on the TFT array substrate 10 by a color resist etc. If it does in this way, a bright electro-optic device is realizable by improving the condensing effectiveness of incident light. Furthermore, the die clo IKKU filter which makes a RGB color using interference of light by depositing the interference layer to which the refractive index of many layers is different on the opposite substrate 20 again may be formed. According to this opposite substrate with a die clo IKKU filter, a brighter color electro-optic device is realizable.

[0123] This invention is not restricted to the operation gestalt mentioned above, and can be suitably changed in the range which is not contrary to the summary or thought of invention which can be read in a claim and the whole specification, and the electro-optic device accompanied by such modification and its manufacture approach are also included in the technical range of this invention.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the top view which looked at the TFT array substrate in the electro-optic device of the operation gestalt of this invention from the opposite substrate side with each component formed on it.
[Drawing 2] It is the H-H' sectional view of drawing 1 .
[Drawing 3] It is the top view extracting and showing the vertical flow pad and sealant which were formed on the TFT array substrate among the various configuration members shown in drawing 1 .
[Drawing 4] It is the top view showing similarly other examples of a vertical flow pad employable with this operation gestalt, and a sealant with drawing 3 .
[Drawing 5] It is the top view showing similarly other examples of a vertical flow pad employable with this operation gestalt, and a sealant with drawing 3 .
[Drawing 6] It is the block diagram of equal circuits established in two or more pixels of the shape of a matrix which constitutes the image display field in the electro-optic device of the operation gestalt of this invention, such as various components and wiring, and a circumference circuit.
[Drawing 7] It is the fragmentary sectional view expanding and showing C1 part of drawing 2 .
[Drawing 8] It is the fragmentary sectional view expanding and showing C2 part of drawing 2 .
[Drawing 9] It is the B-B' sectional view of drawing 1 .
[Drawing 10] It is the diagrammatic sectional view having shown the situation of the gap material in near the boundary of the field in which the vertical flow pad was formed among the seal fields in this operation gestalt, and the field in which the vertical flow pad is not formed.
[Drawing 11] It is the diagrammatic sectional view having shown the situation of the gap material in near the boundary of the field in which the vertical flow pad was formed among the seal fields in the deformation gestalt of 1, and the field in which the vertical flow pad is not formed.
[Drawing 12] It is the diagrammatic sectional view having shown the situation of the gap material in near the boundary of the field in which the vertical flow pad was formed among the seal fields in other deformation gestalten, and the field in which the vertical flow pad is not formed.
[Drawing 13] It is the diagrammatic sectional view having shown the situation of the gap material in near the boundary of the field in which the vertical flow pad was formed among the seal fields in other deformation gestalten, and the field in which the vertical flow pad is not formed.
[Drawing 14] It is the top view of two or more pixel groups where the TFT array substrate with which the data line in the electro-optic device of an operation gestalt, the scanning line, a pixel electrode, etc. were formed adjoins each other.
[Drawing 15] It is the A-A' sectional view of drawing 14 .
[Drawing 16] It is process drawing showing the manufacture process concerning this operation gestalt.
[Drawing 17] It is the top view showing the configuration of a projector.
[Description of Notations]
1a -- Semi-conductor layer
1a' -- Channel field

1b -- Low concentration source field
1c -- Low concentration drain field
1d -- High concentration source field
1e -- High concentration drain field
2 -- Insulator layer
3a -- Scanning line
6a -- Data line
9a -- Pixel electrode
10 -- TFT array substrate
11a -- Bottom light-shielding film
12 -- Substrate insulator layer
16 -- Orientation film
20 -- Opposite substrate
21 -- Counterelectrode
21a -- Vertical flow section
22 -- Orientation film
30 -- TFT
50 -- Liquid crystal layer
52 -- Sealant
70 -- Storage capacitance
71 -- Junction layer
81, 83, 85 -- Contact hole
101 -- Data-line drive circuit
104 -- Scanning-line drive circuit
106, 106', 106" -- Vertical flow pad
108 -- Liquid crystal inlet
114 -- Sampling circuit drive signal line
115 -- Picture signal line
116 -- Drawer wiring
117 -- Counterelectrode signal wiring
118 -- Contact hole
200 -- Resin
201, 201S, 201L -- Gap material
202, 202S, 202L -- Gap material
203 -- Silver dust

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

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[Procedure revision]
[Filing Date] March 18, Heisei 16 (2004. 3.18)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[The contents of amendment]
[Claim(s)]
[Claim 1]
It comes to pinch electrooptic material between the 1st and 2nd substrates of a pair,
It has the sealant which carries out phase adhesion of said 1st and 2nd substrates in the seal field which saw superficially and met to those perimeters between said 1st and 2nd substrates,
It has the vertical flow pad for carrying out a vertical flow with two or more pixel electrodes arranged to the image display field which saw superficially and was surrounded in said seal field on said 1st substrate, and the counterelectrode on said 2nd substrate,
Said vertical flow pad is an electro-optic device characterized by carrying out flattening with the interlayer insulation film under said pixel electrode, and carrying out the vertical flow with said counterelectrode.
[Claim 2]
Said vertical flow pad is an electro-optic device according to claim 1 characterized by carrying out a vertical flow with said counterelectrode through the conductive ingredient contained in said sealant.
[Claim 3]
Said vertical flow pad is an electro-optic device according to claim 1 or 2 characterized by connecting with the counterelectrode signal line arranged under said interlayer insulation film.
[Claim 4]
The interlayer insulation film under said counterelectrode signal line is an electro-optic device according to claim 3 characterized by carrying out flattening.
[Claim 5]
Said counterelectrode signal line is an electro-optic device according to claim 3 or 4 characterized by being formed by the same film as the data line connected to the thin film transistor prepared corresponding to the pixel electrode.
[Claim 6]
It is the manufacture approach of an electro-optic device of manufacturing an electro-optic device,
The process which forms the 1st interlayer insulation film on said 1st substrate, forms said 1st interlayer insulation film and said vertical flow pad, and carries out flattening of both the front faces of said 1st interlayer insulation film and said vertical flow pad,
The process which forms said counterelectrode on said 2nd substrate,
The process which carries out phase adhesion of said 1st substrate and said 2nd substrate by said sealant is included,
The manufacture approach of the electro-optic device characterized by making it flow through said said vertical flow pad and said counterelectrode.
[Claim 7]
Light source,
The light valve which becomes any 1 term of claims 1-5 with the electro-optic device of a publication,
Light guide section material which carries out the light guide of the light generated from said light source to said light valve,
The projection mold display characterized by having the incident light faculty material which projects the light modulated with said light valve.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0005
[Method of Amendment] Modification
[The contents of amendment]
[0005]
[Problem(s) to be Solved by the Invention]
However, if it is going to attain miniaturization of a substrate, or enlargement of an image display field by making a vertical flow field small, the dependability of the vertical flow [itself] will fall.
Or if it is going to attain miniaturization of a substrate, or enlargement of an image display field by making a seal field small to this problem, the dependability of the lamination of both substrates and the dependability of the gap control between substrates will fall.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0006
[Method of Amendment] Deletion
[The contents of amendment]

[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0007
[Method of Amendment] Deletion
[The contents of amendment]

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[Procedure amendment 5]
[Document to be Amended] Specification
[Item(s) to be Amended] 0008
[Method of Amendment] Modification
[The contents of amendment]
[0008]
This invention is made in view of the above-mentioned trouble, and let it be a technical problem to offer the electro-optic device [it is possible to attain simplification of a configuration of to start the configuration concerning the sealant which sticks the substrate of a pair, and the vertical flow between the substrates of a pair, and] which can raise the dependability of this vertical flow, and its manufacture approach.
[Procedure amendment 6]
[Document to be Amended] Specification
[Item(s) to be Amended] 0009
[Method of Amendment] Modification
[The contents of amendment]
[0009]
[Means for Solving the Problem]
In order that the electro-optic device of this invention may solve the above-mentioned technical problem, it comes to pinch electrooptic material between the 1st and 2nd substrates of a pair. It has the sealant which carries out phase adhesion of said 1st and 2nd substrates in the seal field which saw superficially and met to those perimeters between said 1st and 2nd substrates. Two or more pixel electrodes arranged to the image display field which saw superficially and was surrounded in said seal field on said 1st substrate, It is characterized by having the vertical flow pad for carrying out a vertical flow with the counterelectrode on said 2nd substrate, carrying out flattening of said vertical flow pad with the interlayer insulation film under said pixel electrode, and carrying out the vertical flow with said counterelectrode.
[Procedure amendment 7]
[Document to be Amended] Specification
[Item(s) to be Amended] 0010
[Method of Amendment] Modification
[The contents of amendment]
[0010]
It is characterized by said vertical flow pad carrying out the vertical flow of the one mode of the electro-optic device of this invention with said counterelectrode through the conductive ingredient contained in said sealant.
[Procedure amendment 8]
[Document to be Amended] Specification
[Item(s) to be Amended] 0011
[Method of Amendment] Modification
[The contents of amendment]
[0011]
One mode of the electro-optic device of this invention is characterized by connecting said vertical flow pad to the counterelectrode signal line arranged under said interlayer insulation film.

[Procedure amendment 9]
[Document to be Amended] Specification
[Item(s) to be Amended] 0012
[Method of Amendment] Modification
[The contents of amendment]
[0012]
One mode of the electro-optic device of this invention is characterized by carrying out flattening of the interlayer insulation film under said counterelectrode signal line.

[Procedure amendment 10]
[Document to be Amended] Specification
[Item(s) to be Amended] 0013
[Method of Amendment] Modification
[The contents of amendment]
[0013]
It is characterized by being formed by the film as the data line connected to the thin film transistor prepared corresponding to the pixel electrode with one mode of the electro-optic device of this invention same [said counterelectrode signal line].
[Procedure amendment 11]
[Document to be Amended] Specification
[Item(s) to be Amended] 0014
[Method of Amendment] Modification
[The contents of amendment]
[0014]
The process which the manufacture approach of the electro-optic device of this invention forms the 1st interlayer insulation film on said 1st substrate, forms said 1st interlayer insulation film and said vertical flow pad, and carries out flattening of both the front faces of said 1st interlayer insulation film and said vertical flow pad, It is characterized by making it flow through said said vertical flow pad and said counterelectrode including the process which forms said counterelectrode on said 2nd substrate, and the process which carries out phase adhesion of said 1st substrate and said 2nd substrate by said sealant.
[Procedure amendment 12]
[Document to be Amended] Specification
[Item(s) to be Amended] 0015
[Method of Amendment] Deletion
[The contents of amendment]

[Procedure amendment 13]
[Document to be Amended] Specification
[Item(s) to be Amended] 0016
[Method of Amendment] Deletion
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[Procedure amendment 14]
[Document to be Amended] Specification
[Item(s) to be Amended] 0017
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[Procedure amendment 15]
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[Item(s) to be Amended] 0018
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[Procedure amendment 16]
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[Method of Amendment] Deletion
[The contents of amendment]

[Procedure amendment 17]
[Document to be Amended] Specification

[Item(s) to be Amended] 0020
[Method of Amendment] Deletion
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[Procedure amendment 18]
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[Procedure amendment 19]
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[Procedure amendment 20]
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[Procedure amendment 21]
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[Procedure amendment 22]
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[Procedure amendment 23]
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[Procedure amendment 24]
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[Procedure amendment 27]
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[Procedure amendment 32]
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[Procedure amendment 33]
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[Procedure amendment 34]
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[Procedure amendment 35]
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[Procedure amendment 36]
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[Procedure amendment 37]
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[Procedure amendment 38]
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[Procedure amendment 43]
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[Procedure amendment 44]
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[Translation done.]